Further Mathematics GA 2: Written examination 1

GENERAL COMMENTS

Overall, the majority of Further Mathematics students were well prepared for Examination 1 in 2001. The number of students who sat for Further Mathematics Examination 1 in 2001 was 19 602, an increase of 3100 over the 16 501 who sat in 2000.

SPECIFIC INFORMATION

Multiple-choice solutions

The third column gives the percentage of correct responses.

Core

1	A	72
2	C	81
3	C	62
4	D	31
5	D	53
6	B	47
7	A	30
8	A	53
9	E	53
10	D	28
11	A	24
12	C	41
13	B	81

Modules

Module 1: Number patterns and applications

1	D	78
2	C	56
3	B	41
4	C	67
5	D	44
6	E	76
7	A	54
8	E	38
9	C	34

Module 2: Geometry and trigonometry

1	D	64
2	A	73
3	A	41
4	D	75
5	D	39
6	B	60
7	C	44
8	E	42
9	C	48

Module 3: Graphs and relations

1	C	63
2	B	68
3	C	59
4	C	66
5	D	73
6	D	70
7	A	38
8	B	73
9	D	58

Module 4: Business-related mathematics

1	C	67
2	B	77
3	D	50
4	B	31
5	C	39
6	B	26
7	C or D	80
8	A	63
9	B	27

Module 5: Networks and decision mathematics

1	E	63
2	C	89
3	E	60
4	D	55
5	C	72
6	B	78
7	B	46
8	A	68
9	E	28

Areas of strength and weakness

Core

While the Core was generally well done, students performed relatively poorly on four particular questions.

The first of these questions, Question 4, involved the application of the 68-95-99.7% rule. While most answering this question recognised that a systolic blood pressure of 131 was one standard deviation from the mean, only 34% were then able to use the 68-95-99.7% to deduce that 84% (16% + 68%) of students would have a systolic blood pressure **less** than 131.

The other three Questions 7, 10 and 11 involved regression analysis and data transformation. Question 7 required students to determine the equation of the least squares regression line from a small set of bivariate data. Only 30% of students were able to do so correctly. Many students were unaware of the importance of correctly identifying the independent variable (in this case, latitude) and dependent variable (temperature) as part of the process of calculating the equation of a least squares regression line. When working with real data, it **cannot** always be assumed that the first variable listed in a table is the independent variable. In this case it was not, and the 43% of students who failed to recognise this obtained the incorrect answer.

Question 10, which was a routine fitting of a three median line to a scatterplot, was also extremely poorly done with only 28% of students being successful. In teaching this topic, it needs to recognised that the three median line is primarily a graphical method, and this is what should be emphasised in the teaching, not the use of formulas.

In answering Question 11, it was hoped that students would recognise that the scatterplot could be potentially linearised by compressing the upper end of either the x or the y-axis, so that 'either a $\frac{1}{x}$ or a $\frac{1}{y}$ transformation' was the correct answer. Another possibility, although not given as one of the alternatives was 'either a log x or a log y transformation'.

Number patterns and applications

This module was well done with the exception of Questions 8 and 9, which had success rates of 38% and 34% respectively. These questions involved the use of ratio and proportion.

Geometry and trigonometry

This module was moderately well done, with the exception of Questions 5, 8 and 9. Question 5, with a success rate 39%, involved re-scaling of an *area*. Most students, 53%, apparently failed to recognise this and applied a linear scaling. Question 8 was similarly not well done. Presumably students had difficulty in using the bearings given to determine the size of the angle needed to solve the triangle. Question 9, with a 34% success rate, was expected to be difficult because it required students to draw their own diagram.

Graphs and relations

This module was generally well done, with only Question 7 not being done well. This question, which involved the linear representation of a non-linear relation, had a success rate of only 38%. Questions of this type are routinely poorly done, suggesting that teachers should consider spending some more time on this aspect of the module. Relating this topic to data transformations in the core might also be helpful.

Business and related mathematics

This module was moderately well done, with the exception of Questions 4, 6 and 9. The relatively low success rate, 31%, for Question 4, which required students to make deductions from information taken from a standard bank account statement was unexpected. Question 6, with a 26% success rate, aimed at testing the qualitative understanding of the nature of decay of a reducing balance loan. While students need to be able to perform the computations associated with reducing balance loans, they should also spend time developing an understanding of the underlying processes. The low success rate for Question 9 was largely accounted for by students recognising that there were $12n$ payment periods, but failing to convert the yearly interest rate which was given to a monthly interest rate.

Networks and decision mathematics

This module was well done with the exception of Question 9, which had a success rate of only 28%. As neither of the cuts shown in the diagram in Question 9 are stated to be minimum cuts (nor are they), the most that can be concluded from **these** cuts is that the maximum flow does not exceed 12. This suggests that students would benefit from further attention to the concept of a ‘cut’ and its application through the ‘minimum cut-maximum flow’ theorem.